REMARKS

Claims 7-20 are pending in the application; each of the claims has been rejected.

Claims 7, 8, 11-14, 16 and 17 have been amended to recite that the series of selected biomolecules and the series of selected detecting bodies affixed to a phosphor layer or a protective layer are arranged "in a predetermined configuration." Support for this amendment may be found in the specification, such as at page 10, beginning at line 15, where the arrangement of the biomolecules and detecting bodies is discussed. Further, at page 16, lines 15-21, where an example using cDNA is discussed, it is stated that the cDNA location has been previously stored.

No new matter has been added. Entry of this amendment is earnestly solicited.

I. Rejection of claims under 35 U.S.C. §102

At paragraph 3 of the Office Action, claims 7, 8, 10 and 13-15 are rejected under 35 U.S.C. §102(b) as being anticipated by Shiraishi et al.

The Examiner asserts that the claims are drawn to a microarray comprising a stimulable phosphor sheet and multiple kinds of biomolecules arrayed and fixed on the phosphor sheet. The Examiner states that the claims are given their broadest reasonable interpretation consistent with the indefinite claim language, wherein it is unclear how the biomolecules are arrayed and fixed, and the specification wherein the microarray "has broad meanings embracing...a macro array."

The Examiner then repeats the specific references to the claims first made in the Office Action dated August 14, 2001, using the numbering corresponding to the new claims.

In response, Applicants assert the following. The Examiner states that because the biomolecules of Shiraishi et al. are resolved on a support medium (protective layer) wherein the

support medium is adhered to the phosphor layer, the broadest interpretation of the claims would be anticipated by Shiraishi et al. However, Shiraishi et al. states that the support medium is such that it can be used for separation and identification of samples in the autoradiography. Shiraishi et al. also clearly states that the support medium is different from a protective layer of the phosphor sheet. Therefore, Applicants assert that Shiraishi et al., in which an electrophoretic gel is placed or mounted on a stimulable phosphor sheet, is clearly different from the present invention, in which biomolecules are directly fixed on or within a phosphor layer or a protective layer without a support medium. This difference is clearly made in the claims wherein the words "affixed" and "fixed directly" are used. For example, as stated in the present specification at page 7, lines 10-11, the biomolecules are "arrayed and fixed in a spot-like form on a base plate." In contrast, the support medium of Shiraishi et al. is said to "resolve" biomolecules.

In addition, Applicants note that Shiraishi et al. and the present invention are also different in terms of the contents to be analyzed and the advantageous results. Shiraishi et al. is concerned with a stimulable phosphor sheet for use in the autoradiography of electrophoretic gels, and the electrophoretic mobility depending on the molecular weight of the biomolecule is analyzed as the function of the positional information of the image. In Shiraishi et al., difficulties, such as desorption, can be prevented and analytical accuracy can be improved by making the protective layer hydrophilic and tightly bonding the support medium (gel) thereto.

In contrast, the present invention relates to a micro array for use in a so-called "array" method. In the present invention, the amount of a target substance which hybridizes to each of the fixed biomolecules is measured and analyzed. According to the present invention, by fixing the biomolecules directly on or within the phosphor layer or the protective layer, weak radiation

can be detected with high sensitivity and high resolution, whereby further minaturization of dots (increase in the micro array density) can be realized. Unlike the present invention, neither high sensitivity detection nor high resolution detection can be realized in Shiraishi et al., in which the radioactive substances dispersed in the support medium are placed or mounted on a stimulable phosphor sheet. This is because in Shiraishi et al. radiation is attenuated and diverges.

Finally, Applicants note that the pending claims have been amended to clearly state that the series of selected biomolecules and the series of selected detecting bodies which are affixed to the phosphor layer or protective layer are arranged "in a predetermined configuration." Nowhere in Shiraishi et al. is a discussion of fixing the biomolecules resolved by gel electrophoresis in a predetermined configuration. Indeed, the skilled artisan would understand that the nature of the method discussed in Shiraishi et al. results in differential positioning of biomolecules depending on the characteristics of the biomolecules (e.g., size, charge, shape, etc.) and the gel matrix, and the conditions under which the biomolecules are resolved on the electrophoretic gel (e.g., buffer, current, etc.). Thus, Shiraishi et al. does not teach positioning of biomolecules in a predetermined configuration, nor does the nature of the system taught in Shiraishi et al. allow one to position biomolecules in predetermined positions.

In view of these comments, and the amendments to the claims, Applicants assert that Shiraishi et al. does not anticipate the claims. Accordingly, Applicants respectfully request reconsideration and withdrawal of this rejection.

II. Rejection of claims under 35 U.S.C. §103

A. At paragraph 5 of the Office Action, claims 11, 12 and 16-19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Shiraishi et al. in view of Davis et al.

The Examiner repeats his rejection of the claims as being obvious over Shiraishi et al., in view of Davis et al., first set forth in the Office Action dated August 14, 2001, but using the numbering of the new claims. Briefly, the Examiner asserted that Shiraishi et al. teaches a method for analyzing a biomolecule (claims 11 and 12) and a samples (claims 16 and 17), but does not teach labeling the fixed biomolecule by hybridization with a labeled biomolecule. However, the Examiner contends, labeling a biomolecule by hybridization with a labeled biomolecule was well known in the art at the time of the invention as taught by Davis et al. Thus, the Examiner concludes, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the labeling of Shiraishi et al., using the teaching of Davis et al.

In response, Applicants assert that in view of the comments above, and the amendments to the claims, the disclosure of Shiraishi et al. does not make obvious the rejected claims. Indeed, Shiraishi et al. does not teach the arrangement of a series of selected biomolecules or a series of selected detecting bodies "in a predetermined configuration." Nor does Shiraishi et al. suggest that biomolecules could be arranged in predetermined configurations using the gel system taught therein.

Applicants further assert that the disclosure of Davis et al. does not teach or suggest such an arrangement, and thus does not cure the deficiencies of Shiraishi et al.

Thus, the disclosure of Shiraishi et al., in view of Davis et al., does not make obvious the invention recited in the rejected claims. Accordingly, Applicants respectfully request reconsideration and withdrawal of this rejection.

B. At paragraph 6 of the Office Action, claim 9 is rejected under 35 U.S.C. §103(a) as being unpatentable over Shiraishi et al. in view of Heller et al. (U.S. Patent No. 5,632,957).

The Examiner asserts that Shiraishi et al. teaches a microarray comprising a stimulable phosphor layer on a substrate and a protective layer on the phosphor layer, wherein the protective layer has affixed thereto an array of biomolecules wherein the protective layer comprises polyacrylamide and the biomolecules are affixed by electrophoretic resolution using "well-known" methods.

While the Examiner also states that Shiraishi et al. does not specifically teach the protective layer comprising poly-L-lysine, the use of polyacrylamide wherein the surface of the polyacrylamide is functionalized with poly-L-lysine is taught in Heller et al. (col. 18, lines 5-10). The Examiner concludes it would have been obvious to apply the surface modification taught by Heller et al. to the polyacrylamide surface of Shiraishi et al. to provide for covalent attachment of the biomolecules.

In response, Applicants assert that in view of the comments above, and the amendments to the claims, the disclosure of Shiraishi et al. does not make obvious the rejected claims. Indeed, Shiraishi et al. does not teach the arrangement of a series of selected biomolecules or a series of selected detecting bodies "in a predetermined configuration." Nor does Shiraishi et al. suggest that biomolecules could be arranged in predetermined configurations using the gel system taught therein.

Applicants further assert that the disclosure of Heller et al. does not teach or suggest such an arrangement, and thus does not cure the deficiencies of Shiraishi et al.

Thus, the disclosure of Shiraishi et al., in view of Heller et al., does not make obvious the invention recited in the rejected claims. Accordingly, Applicants respectfully request reconsideration and withdrawal of this rejection.

C. At paragraph 7 of the Office Action, claim 20 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Shiraishi et al., in view of Davis et al., as applied to claim 12 above, and further in view of Heller et al.

The Examiner states that Shiraishi et al. teaches a method for analyzing a biomolecule and a sample, as explained above. The Examiner further states that Heller et al. teaches the use of poly-L-lysine to functionalize the surface of the support medium (when it is polyacrylamide) and thereby provide for the covalent attachment of biomolecules, and that Davis et al. teaches the labeling of a biomolecule by hybridization with a labeled biomolecule was well-known in the art at the time of the invention.

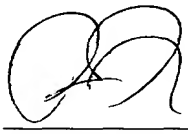
In response, for each of the reasons recited above, Applicants assert that the disclosure of Shiraishi et al., in view of Davis et al. and Heller et al., does not make obvious the invention recited in the rejected claim. Accordingly, Applicants respectfully request reconsideration and withdrawal of this rejection.

III. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



SUGHRUE MION, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

Drew Hissong
Registration No. 44,765

Date: October 9, 2002

APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

7. (Amended) A micro array, comprising a stimulable phosphor layer provided on a substrate, wherein said phosphor layer has affixed thereto an array of a series of selected biomolecules in a predetermined configuration.

8. (Amended) A micro array, comprising a stimulable phosphor layer provided on a substrate and a protective layer provided on said stimulable phosphor layer, wherein said protective layer has affixed thereto an array of a series of selected biomolecules in a predetermined configuration.

11. (Amended) A method for analyzing a biomolecule, comprising the steps of:

(i) preparing a micro array, wherein said micro array comprises a stimulable phosphor layer provided on a substrate, wherein said phosphor layer has affixed thereto an array of a series of selected biomolecules in a predetermined configuration,

(ii) contacting the micro array of step (i) with a labeled biomolecule, to cause the labeled biomolecule to be bound to one or more members of the series of selected biomolecules, wherein said labeled biomolecule is labeled with an energy generating substance,

(iii) exposing the resulting micro array of step (ii) to visible light to thereby induce the release of energy from phosphor molecules in the stimulable phosphor layer,

(iv) placing the micro array of step (iii) in a dark place to thereby cause the stimulable phosphor layer to store energy released from the energy generating substance,

(v) exposing the resulting micro array of step (iv) to stimulating rays which cause the stimulable phosphor layer to emit light in proportion to the amount of energy stored therein,

(vi) photoelectrically detecting the resulting emitted light from step (v) as a signal, so as to detect the one or more members of the series of selected biomolecules which are bound to the labeled molecule, and

(vii) determining the identity of the one or more members of the series of selected biomolecules bound to the labeled biomolecule by comparing the location of the detected signal in the micro array to the location of said one or more members of the series of selected biomolecules based on previously stored positional information.

12. (Amended) A method for analyzing a biomolecule, comprising the steps of:

(i) preparing a micro array, wherein said micro array comprises a stimulable phosphor layer provided on a substrate and a protective layer provided on said phosphor layer, wherein said protective layer has affixed thereto an array of a series of selected biomolecules in a predetermined configuration,

(ii) contacting the micro array of step (i) with a labeled biomolecule, to cause the labeled biomolecule to be bound to one or more members of the series of selected biomolecules, wherein said labeled biomolecule is labeled with an energy generating substance,

(iii) exposing the resulting micro array of step (ii) to visible light to thereby induce the release of energy from phosphor molecules in the stimulable phosphor layer,

(iv) placing the micro array of step (iii) in a dark place to thereby cause the stimulable phosphor layer to store energy released from the energy generating substance,

(v) exposing the resulting micro array of step (iv) to stimulating rays which cause the stimulable phosphor layer to emit light in proportion to the amount of energy stored therein,

(vi) photoelectrically detecting the resulting emitted light from step (v) as a signal, so as to detect the one or more members of the series of selected biomolecules which are bound to the labeled molecule, and

(vii) determining the identity of the one or more members of the series of selected biomolecules bound to the labeled biomolecule by comparing the location of the detected signal in the micro array to the location of said one or more members of the series of selected biomolecules based on previously stored positional information.

13. (Amended) A micro array, comprising a stimulable phosphor layer provided on a substrate, wherein said phosphor layer has affixed thereto an array of a series of selected detecting bodies in a predetermined configuration.

14. (Amended) A micro array, comprising a stimulable phosphor layer provided on a substrate and a protective layer provided on said stimulable phosphor layer, wherein said protective layer has affixed thereto an array of a series of selected detecting bodies in a predetermined configuration.

16. (Amended) A method for analyzing a sample, comprising the steps of:

(i) preparing a micro array, wherein said micro array comprises a stimulable phosphor layer provided on a substrate, wherein said phosphor layer has affixed thereto an array of a series of selected detecting bodies in a predetermined configuration,

(ii) contacting the micro array of step (i) with a sample, wherein said sample comprises a plurality of constituents which are labeled with an energy generating substance, to

cause a constituent in said sample to be bound to one or more members of the series of selected detecting bodies,

(iii) exposing the resulting micro array from step (ii) to visible light to thereby induce the release of energy from phosphor molecules in the stimulable phosphor layer,

(iv) placing the micro array of step (iii) in a dark place to thereby cause the stimulable phosphor layer to store energy release from the energy generating substance,

(v) exposing the resulting micro array of step (iv) to stimulating rays which cause the stimulable phosphor layer to emit light in proportion to the amount of energy stored therein,

(vi) photoelectrically detecting the resulting emitted light from step (v) as a signal, so as to detect a labeled constituent of the sample which is bound to a detecting body, and

(vii) determining the identity of a labeled constituent of the sample by comparing the location of the detected signal in the micro array to the location of said one or more members of the selected detecting bodies based on previously stored positional information.

17. (Amended) A method for analyzing a sample, comprising the steps of:

(i) preparing a micro array, wherein said micro array comprises a stimulable phosphor layer provided on a substrate and a protective layer provided on said phosphor layer, wherein said protective layer has affixed thereto an array of a series of selected detecting bodies in a predetermined configuration,

(ii) contacting the micro array of step (i) with a sample, wherein said sample comprises a plurality of constituents which are labeled with an energy generating substance, to cause a constituent in said sample to be bound to one or more members of the series of selected detecting bodies,

(iii) exposing the resulting micro array from step (ii) to visible light to thereby induce the release of energy from phosphor molecules in the stimulable phosphor layer,

(iv) placing the micro array of step (iii) in a dark place to thereby cause the stimulable phosphor layer to store energy release from the energy generating substance,

(v) exposing the resulting micro array of step (iv) to stimulating rays which cause the stimulable phosphor layer to emit light in proportion to the amount of energy stored therein,

(vi) photoelectrically detecting the resulting emitted light from step (v) as a signal, so as to detect a labeled constituent of the sample which is bound to a detecting body, and

(vii) determining the identity of a labeled constituent of the sample by comparing the location of the detected signal in the micro array to the location of said one or more members of the selected detecting bodies based on previously stored positional information.